

Understanding Cavity-QED and Disorder in Planar Photonic Crystals: Exploiting the Photon Green Function

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Love them or hate them, photon Green functions have a very special role to play in unraveling some of the complexities and mysteries of photonic crystal (PC) science. How to describe genuine quantum optical effects? How to include fabrication imperfections? From an intuitive theoretical perspective, we will introduce, discuss and example several photon Green function techniques that allow one to study a variety of increasingly important optical effects in planar PCs in a remarkably elegant way. We will address both practical (*and potentially profound*) problems and intriguing light-matter interaction regimes, including the role of fabrication disorder in PC waveguides and cavities [1], and cavity-QED with single [2] and several quantum dots [3] in nanocavities.

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- [3] S. Hughes, *PRL*, In press (2005).